



Published in final edited form as:

Tob Control. 2014 November ; 23(0): e114–e121. doi:10.1136/tobaccocontrol-2013-051478.

Racial and nonracial discrimination and smoking status among South African adults ten years after apartheid

Lauren M Dutra^a, David R Williams^b, Ichiro Kawachi^b, and Cassandra A Okechukwu^b

^aThe Center for Tobacco Research and Education, University of California San Francisco, 530 Parnassus Avenue, Suite 366, San Francisco, CA 94143-1390 USA

^bHarvard School of Public Health, Department of Society, Human Development and Health, 677 Huntington Avenue; Boston, MA 02115 USA

Abstract

Background—Despite a long history of discrimination and persisting racial disparities in smoking prevalence, little research exists on the relationship between discrimination and smoking in South Africa.

Methods—This analysis examined chronic (day to day) and acute (lifetime) experiences of racial and nonracial (e.g., age, gender, or physical appearance) discrimination and smoking status among respondents to the South Africa Stress and Health Study (SASH). Logistic regression models were constructed using SAS-Callable SUDAAN.

Results—Both chronic racial discrimination (RR=1.45, 95%CI: 1.14–1.85) and chronic nonracial discrimination (RR=1.69, 95%CI: 1.37–2.08) predicted a higher risk of smoking, but neither type of acute discrimination did. Total (sum of racial and nonracial) chronic discrimination (RR=1.46, 95%CI: 1.20–1.78) and total acute discrimination (RR=1.28, 95%CI: 1.01–1.60) predicted a higher risk of current smoking.

Conclusions—Racial and nonracial discrimination may be related to South African adults' smoking behavior, but this relationship likely varies by the timing and frequency of these experiences. Future research should use longitudinal data to identify the temporal ordering of the relationships studied, include areas outside of South Africa to increase generalizability, and consider the implications of these findings for smoking cessation approaches in South Africa.

Keywords

discrimination; racism; smoking; bias; South Africa

Corresponding Author: Lauren M Dutra, University of California San Francisco, Center for Tobacco Control Research and Education, 530 Parnassus Avenue, Suite 366, San Francisco, CA 94143-1390, Phone: 415.496.0684, Fax: 415.514.9345, lauren.dutra@ucsf.edu.

COMPETING INTERESTS

None of the authors have competing interests in regards to this journal.

CONTRIBUTORSHIP STATEMENT

Lauren M. Dutra: design, data analysis, manuscript preparation

David M. Williams: design, data collection, data analysis, manuscript preparation

Ichiro Kawachi: design, data analysis, manuscript preparation

Cassandra Okechukwu: design, data analysis, manuscript preparation

INTRODUCTION

Although apartheid, the period of legalized institutional racial discrimination in South African history, ended less than 20 years ago (1950–1994), few articles exist on discrimination and health in South Africa. This lack of literature stands in contrast to the large number of publications produced by some other countries with a history of legalized discrimination, such as the United States.[1–6] Race relations remain strained in South Africa today.[7] Historically, the racial status structure of South Africa consisted of Whites at the top, Black Africans at the bottom, and Coloured (a term that generalized South Africans of mixed race into a single category) and Indians or Asians in the middle.[8] According to mid-year 2011 population estimates, 79.5% of South Africans were Black Africans, 9.0% were White, 9.0% were Coloured, and 2.5% were Indian or Asian.[9]

In 2003, approximately 35% of South African men and 10% of South African women smoked daily or occasionally.[10] Among men, prevalence of daily or occasional smoking was 32.8% for Black South Africans, 52.1% for Coloured, 35.7% for Whites, and 55.5% for Indians.[10] Among women, prevalence was 5.2% for Black Africans, 41.8% for Coloured, 27.3% for Whites, and 13.1% for Indians.[10] Racial differences in smoking prevalence are also evidenced by racial disparities in smoking-attributable mortality rates in South Africa. [11] Smoking is associated with increased odds of tuberculosis, chronic obstructive pulmonary disease (COPD), lung cancer, upper digestive tract cancer, ischemic heart disease, cirrhosis of the liver, and other alcohol related conditions among South Africans. [11–12]

We were able to locate only one article on racial discrimination and smoking in South Africa. Brook et al [13] found a positive association between racial discrimination and smoking status among South African adolescents (OR=1.46, 95%CI: 1.21–1.75).

Existing research suggests a relationship between discrimination and smoking.[3–5, 14–23] Several studies have found a significant relationship between experiences of racial and ethnic discrimination and current smoking for African American [1, 3, 5, 16–17] and Hispanic/Latino and Asian American samples in the U.S.[4] Using a multi-state sample of adults ages 45 to 84, Borrell et al [3] found that African American who reported one or more lifetime experiences of racial or ethnic discrimination had 34% greater odds of current smoking than those who reported none. Among Asian Americans, Chae et al [4] found a positive association between both racial and ethnic discrimination and unfair treatment with smoking. Similar findings exist for research conducted in New Zealand.[14, 24–25] Among adults in New Zealand, racial discrimination was significantly associated with smoking status, and the authors found a positive dose-response relationship between number of types of discrimination reported and odds of current smoking.[25]

In order to fully understand the relationship between discrimination and smoking in South Africa, both racial and nonracial discrimination should be assessed. South Africans tend to report lower levels of racial discrimination and higher levels of nonracial discrimination than US samples.[26] However, no English language publication has examined nonracial discrimination and smoking among South Africans.[26] However, several studies conducted

outside of South Africa found positive associations between specific types of nonracial discrimination, such as sexual orientation,[27] sexism,[28–29] immigration-based discrimination,[30] and smoking.

This analysis examined the role of chronic and acute racial and nonracial discrimination in smoking among respondents to the South Africa Stress and Health Study (SASH), a representative sample of South African adults. Prior research on discrimination indicates that like other stressful experiences, discrimination is multidimensional, consisting of acute experiences that are discrete and time-limited and chronic experiences that are ongoing.[31]

The first aim was to examine six types of discrimination, total chronic, chronic racial, chronic nonracial, total acute, acute racial, and acute nonracial, in association with smoking status. The second aim was to explore the association between the number of experiences of each type of discrimination and smoking intensity. We hypothesized that all types of discrimination would be associated with a higher risk of smoking. We also hypothesized a significant positive relationship between number of experiences of discrimination and smoking intensity among smokers.

METHODS

Population and sample

The South Africa Stress and Health Study (SASH) is a nationally representative sample of South African adults collected between 2002 and 2004 to investigate post-apartheid life in South Africa. [32] Human Subjects Committees from the University of Michigan, Harvard Medical School and Medical University of South Africa (MEDUNSA) provided ethics approval before data collection began.[33] Multi-stage stratified random sampling was used to select individuals from enumerated provinces, groupings of homes, and households. In-person interviews were conducted with one individual per household in one of seven languages based on the respondent's preference. Informed consent was obtained from all participants before interviewing began.[33] Further information on sampling techniques can be found in publications by Williams and colleagues.[32–33] After all data was collected, researchers at The University of Michigan and Harvard University created weights that adjusted for sampling techniques and nonresponse.[33]

Measures

Independent variables—All discrimination predictor variables were dichotomized (0 versus one or more) because of limited variability in the number of experiences of discrimination, as well as to create consistent coding across acute and chronic discrimination despite differences in the formats of these scales.

Chronic discrimination—Chronic discrimination was measured using the ten-item version of the Everyday Discrimination Scale, [34] which asks about day-to-day experiences of discrimination and has a Cronbach's alpha of 0.84. This scale is reliable across the four major racial groups in South Africa.[35] The scale assesses the frequency of (1) receiving less courtesy or (2) respect than others; (3) receiving poorer service; people acting as if they are (4) afraid of you, (5) think you are dishonest, (6) think they are superior to you, or (7)

think that you are not smart; (8) being called names or insulted, (9) threatened or harassed, and (10) “followed around” in stores. Response options were a six-point Likert scale that ranged from “almost everyday” (1) to “never” (6). The number of items endorsed as occurring “ever” or more frequently were added up and then dichotomized (0 versus one or more experiences) to create the total chronic discrimination variable.

An eleventh item in the scale asked, “What do you think was the main reason for this/these experience(s)?” Experiences attributed to race or tribe were coded as chronic *racial* discrimination. Experiences attributed to age, gender, height or weight, other aspect of physical appearance, or “other” were coded as chronic *nonracial* discrimination. Both variables were dichotomized as zero versus one or more experiences. We also examined the chronic nonracial discrimination subtypes of age, gender, physical appearance, or other whenever the small number of respondents endorsing these items did not prevent us from doing so. These types of discrimination were also dichotomized as 0 experiences versus one or more.

Acute discrimination—Acute discrimination was measured using nine questions about lifetime experiences of discrimination within multiple domains.[32] Respondents were asked whether they had ever... (1) been unfairly fired; (2) for unfair reasons, not been hired for a job; (3) unfairly been denied a promotion; (4) unfairly been stopped, searched, questioned, physically threatened or abused by the police; (5) unfairly been discouraged by a teacher or advisor from continuing their education; (6) unfairly been prevented from moving into a neighborhood, (7) moved into a neighborhood where neighbors made it difficult for them or their family; (8) been unfairly denied a bank loan; and (9) received service that was worse than what other people get. Response options were “yes” and “no”. The number of items was counted up and dichotomized (0 versus one or more experiences).

Respondents were asked to hypothesize a reason for *each* experience they endorsed, choosing from the same list of personal characteristics included in the Everyday Discrimination Scale. Attributions were coded as *racial* or *nonracial* discrimination based on the same criteria used for chronic discrimination. Both variables were dichotomized as zero versus one or more experiences. We also examined the acute nonracial discrimination subtypes of age, gender, physical appearance, or other whenever the small number of respondents endorsing these items did not prevent us from doing so. These types of discrimination were also dichotomized as 0 experiences versus one or more.

Outcome variables—The primary outcome variable was dichotomous smoking status (current smokers versus all others). Current smokers had smoked 100 cigarettes or more in their lifetimes and self-identified as “current smoker” when given the options of current, past, or never smoker. All other respondents (former and never smokers) were classified as non-smokers. For respondents with missing values, responses to a third question, “Are you a current smoker?” (yes/no) were used to aid in the determination of smoking status. The mean number of cigarettes smoked per day (smoking intensity) among smokers was also examined as an outcome variable.

Covariates—Covariates included age, gender, education, race, household income (adjusted by number of household members), and marital status. Because of potential differences in racial segregation across urban and rural settings in South Africa, urbanicity (urban or rural residence) was examined as a potential confounder.

Ethnic identification, one's sense of belonging with those of a similar ethnic group that has a similar cultural background and origin, was tested as an effect modifier and confounder of discrimination and smoking.[4, 17] Questions interpreted as assessments of ethnic identification included 1) "How closely do you identify with other people... of the same racial descent...?" (1="very closely" to 4="not at all"); 2) "How close do you feel in your ideas and feelings ... to other people of the same racial descent?" (1="very closely" to 4="not at all"); 3) "How much time would you like to spend with ... people... of your same racial group?" (1="a lot" to 4="none"), and 4) "How important ... for people ... from your racial group to marry ... people... from this group? (1="very important" to 4="not at all important"). Scores were summed and divided at the median (≤ 8 =low ethnic identification, >8 =high ethnic identification).[4, 17]

Statistical analyses

Chi-squared analyses were used for bivariate analyses of each type of discrimination by race and smoking status. McNemar's tests were used for bivariate statistics for the number of experiences of discrimination and smoking intensity. SAS-callable SUDAAN 11 was used for all modeling because the clustered sampling design could contribute to correlated values within sampling tracts. SUDAAN enabled us to adjust for selection based on household size and non-response, and to make the sample comparable to the 2001 South African census data.

Because of the high prevalence of smoking among respondents in SASH, which likely violated the rare disease assumption, SUDAAN was used to construct log-binomial models of discrimination and the relative risk of smoking. In addition to models using dichotomous discrimination predictor variables, we also tested for a dose-response relationship between discrimination and smoking. We used log-binomial models to examine the relationship between the number of items endorsed for each type of discrimination and smoking risk. PROC LOGLINK was used to create multivariable log-linear regression models of the sum of the number of experiences of each type of discrimination and smoking intensity. In order to create consistency with the majority of the tobacco literature, all multivariable models were adjusted by covariates that tend to correlate with smoking behavior: race, gender, age, education, and income.[36] For each type of discrimination, respondents who had one or more missing questionnaire responses were excluded from multivariable analyses.

First, total chronic discrimination and total acute discrimination were modeled in two separate models. Then, chronic racial and nonracial discrimination were modeled in one model and acute racial and nonracial discrimination in another model. In order to lessen concerns about collinearity, we excluded respondents who endorsed both racial and nonracial discrimination (n=99, 2.3% of sample), thereby creating mutually exclusive exposure categories for acute discrimination. Interaction terms were tested for each type of discrimination by demographic covariates.

RESULTS

The majority of the sample was Black African (76.4%), female (54.0%), between the ages of 18 and 34 (51.1%), and reported 12 years of education or less (84.7%; Table 1).

Chronic racial discrimination varied significantly by race ($p<.0001$; Table 2). Indians/Asians and Black Africans reported the highest levels of chronic racial discrimination (17.6% and 15.6% respectively) and nonracial discrimination (29.6% and 31.1% respectively).

Acute racial ($p=.0033$) discrimination varied significantly by race (Table 2), with Indian/Asians and Black Africans reporting the highest levels of acute racial discrimination (11.2% and 7.8% respectively). Indians/Asians and Whites had highest levels of acute nonracial discrimination (20.0% and 17.3% respectively).

Analyses of subtypes of nonracial chronic discrimination revealed that, compared to smokers, nonsmokers reported a higher prevalence of discrimination related to gender (7.8% versus 6.1%, $p=.2628$) and “other” (13.7% versus 2.7%, $p=.0047$), and smokers reported a higher prevalence of discrimination related to age (8.7% versus 6.2%, $p=.2269$) and physical appearance (7.8% versus 5.9%, $p=.3966$; see Table S1). Blacks reported higher levels of discrimination based on age (10.5%, $p=.0062$) and physical appearance (10.5%, $p<.0001$) than other racial groups (see Table S2). Women reported higher levels of sexism than men (17.7% versus 9.7%, $p=.0034$; see Table S3).

For subtypes of nonracial acute discrimination, smokers had a higher prevalence of discrimination attributed to “other” (13.1% versus 7.9%, $p=.0125$) than nonsmokers (Table S1). Whites had a higher prevalence of discrimination attributed to physical appearance (14.5%, $p=.0001$) and “other” (86.9%, $p<.0001$) than other racial groups (Table S2). The prevalence of sexism was higher for women than men (8.3% versus 3.5%, $p=.0393$; Table S3).

Chronic discrimination

In unadjusted regression analyses, chronic racial discrimination ($RR=1.32$, 95%CI: 1.08–1.62) and chronic nonracial discrimination ($RR=1.40$, 95%CI: 1.12–1.74) were significantly associated with smoking status (Table 3). Total chronic discrimination was also significantly associated with smoking status ($RR=1.33$, 95%CI: 1.12–1.59). Adjusting for covariates increased the relative risk of smoking associated with chronic racial discrimination ($RR=1.45$, 95%CI: 1.14–1.85), nonracial discrimination ($RR=1.69$, 95%CI: 1.37–2.08; Table 3), and total discrimination ($RR=1.46$, 95%CI: 1.20–1.78).

Tests for interactions revealed a significant positive interaction of chronic racial discrimination by gender ($p=.0370$) and chronic nonracial discrimination by race ($p=.0009$). Among those who experienced racial discrimination, the relative risk of smoking was significantly higher for men ($RR=1.41$, 95%CI: 1.15–1.72) than for women ($RR=1.01$, 95%CI: 0.61–1.68). Among respondents who endorsed nonracial discrimination, Black Africans ($RR=1.67$, 95%CI: 1.24–2.25) and Whites ($RR=2.62$, 95%CI: 1.69–4.06) had a higher risk of smoking than South Africans of Coloured ($RR=1.09$, 95%CI: 0.67–1.77) or

Indian, Asian, or “other” descent (RR=1.00, 95%CI: 0.57–1.74). Urbanicity was not included in multivariable models because it was not a significant confounder.

In models of number of chronic discrimination items endorsed and smoking risk, adjusting for weights, stratification variables, and covariates, each one-item increase in discrimination was associated with a 5% increase in risk of smoking (RR=1.05, 95%CI: 1.02–1.08) for total chronic discrimination, 3% for chronic racial discrimination (RR=1.03, 95%CI: 0.99–1.08), and 5% for chronic nonracial discrimination (RR=1.05, 95%CI: 1.01–1.08). In multivariable models restricted to smokers, the number of experiences of chronic racial discrimination (Wald Chi square= 19.97, $p=.0295$) and nonracial discrimination (Wald Chi square= 26.89, $p=.0027$) were positively associated with mean cigarettes smoked per day.

Acute discrimination

In unadjusted analyses, neither acute racial discrimination (RR=1.22, 95%CI=0.84–1.77) nor acute nonracial discrimination (RR=1.25, 95%CI: 0.92–1.68) was significant (Table 3). However, total acute discrimination was significant (RR=1.37, 95%CI: 1.14–1.64). Adjusting for covariates, racial discrimination (RR=1.07, 95%CI: 0.67–1.70) and nonracial discrimination (RR=1.18, 95%CI: 0.85–1.66) remained non-significant (Table 3). However, total acute discrimination remained significant (RR=1.28, 95%CI: 1.01–1.60). For acute discrimination, the only significant interaction was nonracial discrimination by gender ($p=.0391$). Among respondents who endorsed acute nonracial discrimination, women had a significantly higher risk of smoking (RR=1.68, 95%CI: 1.06–2.67) than men (RR=1.06, 95%CI: 0.49–1.42). Urbanicity was not a significant confounder in any of the models. The number of experiences of each type of acute discrimination was not associated with cigarettes smoked per day.

For acute total discrimination, there was a nonlinear relationship number of scale items endorsed and smoking risk. Risk of smoking was greater (RR=1.17, 95%CI: 1.05–1.29) for one experience of discrimination versus zero than for 7 experiences versus 6 (the maximum, RR=1.12, 95%CI: 1.07–1.17). Results were non-significant for number of items of acute racial and nonracial discrimination endorsed.

Ethnic identification was not a significant effect modifier or confounder for any type of discrimination.

DISCUSSION

This analysis used a nationally representative probability sample of South African adults to examine the association between multiple types of discrimination and smoking status. For racial and nonracial discrimination, the significance of these associations varied by whether discrimination was acute or chronic. However, both total chronic and acute discrimination were significant predictors of smoking status. Analyses of the number of experiences of discrimination and both smoking status and smoking intensity suggest that a dose-response relationship may exist for some types of discrimination and smoking.

Interaction terms suggested variation in the relationship between discrimination and smoking by gender and race. Chronic racial discrimination may impact smoking more for men than women, and acute nonracial discrimination may impact smoking more for women than men. A number of potential explanations exist for this finding. Gender-based differences in the prevalence and reaction to experiences of sexism, as well as differences in psychological and physiological responses to chronic and acute stress, may explain these relationships. Unmeasured mediators or confounders, differences in stress responses to discrimination,[37–38] gender differences in socialization patterns and social support networks,[39] and gender norms about smoking in South Africa may have also influenced these findings.[28, 37] Analyses of subtypes of nonracial discrimination did not explain the interactions we found as women were more likely than men to report sexism for both chronic ($p=.0034$) and acute ($p=.0393$) discrimination.

The association between chronic nonracial discrimination and smoking was significant for Black Africans and Whites but not Coloured or Indians, Asians, or other race. This finding is consistent with studies that found racial/ethnic variation in the relationship between discrimination and smoking in U.S. samples.[17, 19, 23] Interestingly, the Coloured and White groups had low levels of discrimination but a high prevalence of smoking. These findings are likely due to the fact that these groups have a higher prevalence of demographic characteristics associated with higher smoking prevalence in the sample (e.g., male gender, ages 35 to 49, low or high income, and separated, widowed, or divorced marital status; see Table S4). Unmeasured confounders, variation in successful smoking cessation by race in South Africa,[38, 40] and racial differences in influences on smoking behavior may have also contributed to these findings.[38]

Surprisingly low levels of racial discrimination were reported given South Africa's history of racial conflict, particularly when compared to levels of racial discrimination in the U.S. [26] In addition to a positive view of race relations post-apartheid and marked racial differences in SES, current segregation and isolation may limit interracial interaction, especially as equals, contributing to artificially low levels of perceived interpersonal racial discrimination. [35, 41]

Our results were similar to those of the only other study on racial discrimination and smoking in South Africa. Among South African adolescents, Brook et al [13] found a significant positive association between racial discrimination and being an experimental ($OR=1.41$, 95%CI: 1.14–1.75) or current smoker ($OR=1.46$, 95%CI: 1.21–1.75) versus a nonsmoker.

Our results were also consistent with findings from non-South African samples. We were able to locate one such study that examined both chronic and acute discrimination. However, the analysis did not differentiate between racial and nonracial discrimination. High ($PR=1.41$, 95%CI: 1.15–1.74) and moderate ($PR=1.19$, 95%CI: 1.05–1.36) scores on the Everyday Discrimination Scale were associated with a higher prevalence of current smoking among pregnant women in the U.S.[1] There was also a significant relationship between scores from a two-item acute discrimination scale and current smoking, but the relationship was not significant in adjusted models. Borrell et al [3] found a positive association between

racial discrimination and current (versus never) smoking for both Black (OR=1.34, 95%CI: 1.00–1.81) and White Americans (OR=1.88, 95%CI: 1.02–3.49) enrolled in the Multi-Ethnic Study of Atherosclerosis (MESA). In a study of African American college students, respondents who experienced racial harassment were twice as likely to smoke on a daily basis as those who reported none (OR=2.10, 95%CI: 1.23–3.58) [15]. Chae et al [4] found a significant relationship between high levels of racial discrimination and current smoking among Asian Americans (OR=3.06, 95%CI: 1.07–9.72). Using a New Zealand sample, Harris et al [25] found a significant relationship between overall discrimination (OR=1.36, 95% CI: 1.17–1.58), as well as discrimination-related personal attacks in general (OR=1.46, 95%CI: 1.25–1.71) and physical (OR=2.29, 95%CI: 1.64–3.21) and verbal attacks specifically (OR=1.34, 95%CI: 1.15–1.57), and current smoking status.

Although we were unable to locate any publications that studied nonracial discrimination as one overarching category, studies on specific types of nonracial discrimination, such as sexism, support a relationship between nonracial discrimination and smoking. Among Chinese female rural-to-urban migrant restaurant and hotel workers and sex workers in China, perceived discrimination (due to migrant status) was positively associated with the risk of being a current smoker.[30] Restaurant and hotel workers, and sex workers, who reported one or more experiences of discrimination had 2.52 (95% CI: 1.32–4.79) and 1.63 (95% CI: 1.28–2.06) times the prevalence of smoking, respectively, compared to members of those groups who reported none. Borrell and colleagues [29] found that female Spanish natives in Spain who reported any experience of sexism in the past year had higher odds of being a current or ex-smoker (versus never smoker, OR=1.45, 95%CI: 1.07–1.96). An analysis of female American college students also found a positive significant relationship between sexism and smoking status ($p<.05$).[28]

Several potential explanations [3, 42] have been offered for the relationship between discrimination and smoking. First, smokers may actually experience higher levels of discrimination due to smoking-related stigma, especially Black women in South Africa, for whom smoking is considered especially taboo.[38] Some smokers may falsely attribute this discrimination to personal characteristics other than smoking status. It is possible that our “other” discrimination category may have captured discrimination related to smoking status. However, reports of “other” discrimination did not differ significantly by smoking status. Second, smoking may seem less risky to an individual whose experiences of discrimination have been life-threatening. If these experiences are perceived as a greater health risk than smoking, these individuals may not be motivated to quit.[43] Third, discrimination is a stressor that impacts physiological reactivity to stress, such as cortisol production, and smoking also impacts perceived stress.

Because of different physiological responses, mild chronic stressors may have a greater impact on health outcomes than infrequent (acute) stressors, even when severe.[1, 34] We hypothesize that the differences in our results between acute and chronic discrimination are due to differences in the physiological effects of acute and chronic stress.[44] Acute stressors lead to an initial increase in cortisol exposure, which returns to normal or slightly below normal shortly after the stressor is removed. In contrast, chronic stressors are associated with chronically high cortisol levels,[45] which may impact nicotine sensitivity

[31] and psychological coping with stress,[3] as well as decrease self control in resisting unhealthy behaviors.[42] Smoking is often used as a coping mechanism because nicotine decreases anxiety and generate a sense of well-being.[46] In an analysis of American girls ages 11 to 19, Guthrie et al [5] found that stress explained a significant proportion ($p<.05$) of the relationship between discrimination and smoking. However, additional research is needed.

The primary limitation of this analysis is the cross-sectional nature of the data, which precludes us from making causal statements based on our results. One of the limitations of this analysis is its use of self-report. However, existing research suggests that self-reported smoking is a reasonably valid measure of cigarette consumption in population-level studies. [47] As always, unmeasured confounding must be considered as a potential limitation. However, careful assessment of potential confounders decreases the likelihood of unmeasured confounding. Another potential limitation is our use of two-category smoking outcome, which may have occluded differences between former smokers and current and non-smokers. However, we conducted additional analyses that coded smoking status into three categories (current, former, never) but did not find any significant differences between current and former or former and never smokers.

Because many of the respondents did not specify the type of acute or chronic nonracial discrimination (e.g., sexism, ageism), another limitation is that there was insufficient statistical power to analyze each type of nonracial discrimination separately (e.g., sexism, ageism) for the entire sample. However, cell sizes were large enough to run these analyses for Black Africans. The relationship between chronic discrimination and smoking was driven by racial discrimination (RR=1.20, 95%CI: 1.08–1.33), age (RR=1.98, 95%CI: 1.14–3.44), and “other” (RR=1.56, 95%CI: 1.04–2.32). Acute racial and nonracial discrimination were not significant for this group. Unfortunately, despite these analyses, we were still unable to make comparisons across multiple races.

In addition, because of the small number of Whites who reported chronic ($n=5$, 1.6%) and acute ($n=5$, 3.1%) racial discrimination, these percentages should be interpreted with care given high relative standard errors (50.0% and 29.4% respectively). However, these values did not appear to impact our analyses; dropping Whites from analyses yielded similar results for chronic (racial: RR=1.39, 95%CI: 1.08–1.79; nonracial: RR=1.53, 95%CI: 1.20–1.93) and acute discrimination (racial: RR=1.05, 95%CI: 0.66–1.65; nonracial: RR=1.04, 95%CI: 0.77–1.41). A final limitation is that, although we used the labels “acute” and “chronic” discrimination to conform to previous publications on these questionnaires,[32, 34] we acknowledge that these terms are complex and that definitions may overlap.

This analysis also has several strengths. This is the first analysis of discrimination and smoking among South African adults. Because of the inclusion of both racial and nonracial discrimination, this analysis captured experiences of discrimination that may not have been examined had analyses only focused on either racial or nonracial discrimination. South Africans may tend to attribute racial discrimination to other factors, possibly due to a reluctance to discuss race in the post-apartheid era.[34–35] This analysis is also unique because it provides insight into the role of both chronic and acute racial and nonracial

discrimination in smoking behavior. Also, the use of SUDAAN and weighting allowed researchers to adjust for any bias created by sampling techniques and made the results generalizable to South African adults. Yet another strength of this analysis is the use of relative risks, which provided more conservative effect estimates than odds ratios, thereby reducing the risk of Type I error. The finding of a dose-response relationship between chronic discrimination and smoking intensity suggests that our findings are unlikely to be spurious.

Despite our extensive analysis of multiple types of discrimination, additional research is needed. Future research should use longitudinal data to examine the temporal ordering of racial and nonracial discrimination and smoking initiation, maintenance, and cessation in South Africa, as well as to examine stress as a potential mediator. Additional research should also attempt to generalize our results to populations outside of South Africa. We also recommend that, despite our non-significant results, the potential role of ethnic identity be considered in future analyses of discrimination and smoking.[4, 17] We also propose that future research tests social policies that may combat discrimination. In October of 2013, South African President Jacob Zuma called for a conference to combat discrimination suffered by apartheid victims, proposing measures such as increasing opportunities for Black businesses.[48] In addition to these types of policies, social policies that promote racial integration also have the potential to increase positive interracial relations by reducing prejudice and increasing tolerance.[49] Because of the link between socioeconomic status and race, housing and educational policies that provide opportunities for low-income individuals to live in middle income settings may decrease racial and socioeconomic segregation. These policies have been somewhat effective in the United States, where SES and race are closely related.

We also propose additional research on smoking cessation interventions in South Africa, which could be tailored by race and consider the potential role of stress and discrimination and smoking behavior. A study of South African adolescents found that social and cognitive predictors of being a former smoker, such as attitudes towards smoking, mood, and smoking by friends and family, varied by race.[38] However, because of a lack of research, effective targets for smoking cessation remain unclear. The link between stress and smoking [50–52] suggests that interventions that combine smoking cessation with stress management techniques may be effective, especially for disadvantaged populations.[53] However, we are unaware of any study that has used randomized controlled trials to examine the efficacy of a stress management component. Because of a potential link between alcohol dependence and smoking cessation in South Africa,[54] another opportunity for intervention is to incorporate smoking cessation into alcohol dependence programs.

The solution to these issues, if one exists, is extremely complex. However, given the potential link between discrimination and smoking, we cannot afford to ignore it.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

ACKNOWLEDGMENTS

None

FUNDING

This work was supported by National Cancer Institute grant numbers 3R25CA057711-18S1, R25CA-113710, and R01CA-61021 and the National Center for Chronic Disease Prevention and Health Promotion grant number 1R01DP000097-01.

REFERENCES

1. Bennett IM, Culhane JF, Webb DA, et al. Perceived discrimination and depressive symptoms, smoking, and recent alcohol use in pregnancy. *Birth-Issues in Perinatal Care*. 2010; 37:90–97.
2. Borrell LN, Jacobs DR, Williams DR, et al. Self-reported racial discrimination and substance use in the Coronary Artery Risk Development in Adults study. *Am J Epidemiol*. 2007; 166:1068–1079. [PubMed: 17698506]
3. Borrell LN, Roux AVD, Jacobs DR, et al. Perceived racial/ethnic discrimination, smoking and alcohol consumption in the Multi-Ethnic Study of Atherosclerosis (MESA). *Prev Med*. 2010; 51:307–312. [PubMed: 20609433]
4. Chae DH, Takeuchi DT, Barbeau EM, et al. Unfair treatment, racial/ethnic discrimination, ethnic identification, and smoking among Asian Americans in the National Latino and Asian American study. *Am J Public Health*. 2008; 98:485–492. [PubMed: 18235073]
5. Guthrie BJ, Young AM, Williams DR, et al. African American girls' smoking habits and day-to-day experiences with racial discrimination. *Nurs Res*. 2002; 51:183–190. [PubMed: 12063417]
6. Landrine H, Klonoff EA. Racial discrimination and cigarette smoking among Blacks: findings from two studies. *Ethn Dis*. 2000; 10:195–202. [PubMed: 10892825]
7. Bornman E. Patterns of intergroup attitudes in South Africa after 1994. *Int J Intercult Relat*. 2011; 35:729–748.
8. Brown K. Coloured and black relations in South Africa: The burden of racial hierarchy. *Macalester International*. 2000; 9:198–207.
9. Statistics South Africa. Statistical Release. Pretoria, South Africa: Statistics South Africa; 2011. Mid-year population estimates 2011.
10. Peer N, Bradshaw D, Laubscher R, et al. Trends in adult tobacco use from two South African Demographic and Health Surveys conducted in 1998 and 2003. *S Afr Med J*. 2009; 99:744–749. [PubMed: 20128274]
11. Sitas F, Egger S, Bradshaw D, et al. Differences among the coloured, white, black, and other South African populations in smoking-attributed mortality at ages 35–74 years: a case-control study of 481,640 deaths. *Lancet*. 2013; 382:685–693. [PubMed: 23972813]
12. Sitas F, Urban M, Bradshaw D, et al. Tobacco attributable deaths in South Africa. *Tob Control*. 2004; 13:396–399. [PubMed: 15564624]
13. Brook JS, Morojele NK, Brook DW, et al. Personal, interpersonal, and cultural predictors of stages of cigarette smoking among adolescents in Johannesburg, South Africa. *Tob Control*. 2006; 15:I48–I53. [PubMed: 16723676]
14. Crengle S, Robinson E, Ameratunga S, et al. Ethnic discrimination prevalence and associations with health outcomes: data from a nationally representative cross-sectional survey of secondary school students in New Zealand. *BMC Public Health*. 2012; 12
15. Bennett GG, Wolin KY, Robinson EL, et al. Perceived racial/ethnic harassment and tobacco use among African American young adults. *Am J Public Health*. 2005; 95:238–240. [PubMed: 15671457]
16. Kwate NOA, Valdimarsdottir HB, Guevarra JS, et al. Experiences of racist events are associated with negative health consequences for African American women. *J Natl Med Assoc*. 2003; 95(6): 450–460. [PubMed: 12856911]

17. Nguyen KH, Subramanian SV, Sorensen G, et al. Influence of experiences of racial discrimination and ethnic identity on prenatal smoking among urban black and Hispanic women. *J Epidemiol Community Health*. 2012; 66:315–321. [PubMed: 20974840]
18. Borrell LN, Kiefe CI, Diez-Roux AV, et al. Racial discrimination, racial/ethnic segregation, and health behaviors in the CARDIA study. *Ethn Health*. 2013; 18:227–243. [PubMed: 22913715]
19. Benjamins MR. Comparing measures of racial/ethnic discrimination, coping, and associations with health-related outcomes in a diverse sample. *J Urban Health*. 2013; 90:832–848. [PubMed: 23430374]
20. Carty DC, Kruger DJ, Turner TM, et al. Racism, health status, and birth outcomes: results of a participatory community-based intervention and health survey. *J Urban Health*. 2011; 88:84–97. [PubMed: 21271359]
21. Okamoto J, Ritt-Olson A, Soto D, et al. Perceived discrimination and substance use among Latino adolescents. *Am J Health Behav*. 2009; 33:718–727. [PubMed: 19320620]
22. Purnell JQ, Peppone LJ, Alcaraz K, et al. Perceived discrimination, psychological distress, and current smoking status: results from the Behavioral Risk Factor Surveillance System Reactions to Race module 2004–2008. *Am J Public Health*. 2012; 102:844–851. [PubMed: 22420821]
23. Tran AG, Lee RM, Burgess DJ. Perceived discrimination and substance use in Hispanic/Latino, African-born Black, and Southeast Asian immigrants. *Cultur Divers Ethnic Minor Psychol*. 2010; 16:226–236. [PubMed: 20438161]
24. Harris R, Tobias M, Jeffreys M, et al. Racism and health: The relationship between experience of racial discrimination and health in New Zealand. *Soc Sci Med*. 2006; 63:1428–1441. [PubMed: 16740349]
25. Harris R, Cormack D, Tobias M, et al. The pervasive effects of racism: Experiences of racial discrimination in New Zealand over time and associations with multiple health domains. *Soc Sci Med*. 2012; 74:408–415. [PubMed: 22204840]
26. Williams DR, Haile R, Mohammed SA, et al. Perceived discrimination and psychological well-being in the U.S. and South Africa. *Ethn Health*. 2012; 17:111–133. [PubMed: 22339224]
27. Blonich JR, Horn K. Associations of Discrimination and Violence With Smoking Among Emerging Adults: Differences by Gender and Sexual Orientation. *Nicotine Tob Res*. 2011; 13:1284–1295. [PubMed: 21994344]
28. Zucker AN, Landry LJ. Embodied discrimination: The relation of sexism and distress to women's drinking and smoking behaviors. *Sex Roles*. 2007; 56:193–203.
29. Borrell C, Artazcoz L, Gil-Gonzalez D, et al. Perceived sexism as a health determinant in Spain. *J Womens Health*. 2010; 19:741–750.
30. Shin SS, Wan X, Wang Q, et al. Perceived discrimination and smoking among rural-to-urban migrant women in China. *J Immigr Minor Health*. 2012; 15:132–140. [PubMed: 22389186]
31. Cohen, S.; Kessler, RC.; Gordon, LU. Strategies for measuring stress in studies of psychiatric and physical disorders. In: Cohen, S.; Kessler, RC.; Lynn, UG., editors. *Measuring Stress: A Guide for Health and Social Scientists*. New York: Oxford University Press; 1995.
32. Williams DR, Herman A, Stein DJ, et al. Twelve-month mental disorders in South Africa: prevalence, service use and demographic correlates in the population-based South African Stress and Health Study. *Psychol Med*. 2008; 38:211–220. [PubMed: 17903333]
33. Williams DR, Herman A, Kessler RC, et al. The South Africa Stress and Health Study: Rationale and design. *Metab Brain Dis*. 2004; 19:135–147. [PubMed: 15214513]
34. Williams DR, Yu Y, Jackson JS. Racial differences in physical and mental health: Socioeconomic status, stress and discrimination. *J Health Psychol*. 1997; 2:335–351. [PubMed: 22013026]
35. Williams DR, Gonzalez HM, Williams SL, et al. Perceived discrimination, race and health in South Africa. *Soc Sci Med*. 2008; 67:441–452. [PubMed: 18486292]
36. Okechukwu CA, Nguyen K, Hickman NJ. Partner smoking characteristics: Associations with smoking and quitting among blue-collar apprentices. *Am J Ind Med*. 2010; 53:1102–1108. [PubMed: 20721966]
37. Amos A, Haglund M. From social taboo to “torch of freedom”: the marketing of cigarettes to women. *Tob Control*. 2000; 9:3–8. [PubMed: 10691743]

38. Panday S, Reddy SP, Ruiter RAC, et al. Determinants of smoking cessation among adolescents in South Africa. *Health Educ Res.* 2005; 20:586–599. [PubMed: 15772246]
39. Wiehe SE, Aalsma MC, Liu GC, et al. Gender differences in the association between perceived discrimination and adolescent smoking. *Am J Public Health.* 2010; 100:510–516. [PubMed: 20075313]
40. Department of Health, Medical Research Council, OrcMacro. Pretoria: Department of Health; 2007. South Africa Demographic and Health Survey 2003.
41. Durrheim K, Dixon J. Racial contact and change in South Africa. *J Soc Issues.* 2010; 66:273–288.
42. Pascoe EA, Richman LS. Perceived discrimination and health: A meta-Analytic review. *Psychol Bull.* 2009; 135:531–554. [PubMed: 19586161]
43. Dow WH, Holmes J, Philipson T, et al. Disease complementarities and the evaluation of public health interventions. NBER Working Paper Series. 1995; 5216:1–37.
44. Cohen S, Janicki-Deverts D, Miller GE. Psychological Stress and Diseases. *JAMA.* 2007; 298:1685–1687. [PubMed: 17925521]
45. Miller GE, Chen E, Zhou ES. If it goes up must it come down? Chronic stress and the Hypothalamic-Pituitary-Adrenocortical axis in humans. *Psychol Bull.* 2007; 133:25–45. [PubMed: 17201569]
46. Williams DR, Mohammed SA. Discrimination and racial disparities in health: evidence and needed research. *J Behav Med.* 2009; 32:20–47. [PubMed: 19030981]
47. Velicer WF, Fava JL, Prochaska JO, et al. Distribution of smokers by stage in three representative samples. *Prev Med.* 1995; 24:401–411. [PubMed: 7479632]
48. Khumalo, T. Deutsche Welle. Johannesburg: Deutsche Welle; 2013. South Africa holds conference on positive discrimination for apartheid victims.
49. Williams D, Mohammed S. Racism and Health II: A Needed Research Agenda for Effective Interventions. *Am Behav Sci.* 2013; 57:1152–1173.
50. Back S, Waldrop A, Saladin M, et al. Effects of gender and cigarette smoking on reactivity to psychological and pharmacological stress provocation. *Psychoneuroendocrinology.* 2008; 33:560–568. [PubMed: 18321653]
51. Kassel JD, Stroud LR, Paronis CA. Smoking, stress, and negative affect: Correlation, causation, and context across stages of smoking. *Psychol Bull.* 2003; 129:270–304. [PubMed: 12696841]
52. Parrott AC. Nesbitt's Paradox resolved? Stress and arousal modulation during cigarette smoking. *Addiction.* 1998; 93:27–39. [PubMed: 9624709]
53. Tsourtos G, O'Dwyer L. Stress, stress management, smoking prevalence and quit rates in a disadvantaged area: has anything changed? *Health Promot J Aust.* 2008; 19:40–44.
54. Ayo-Yusuf OA, Szymanski B. Factors associated with smoking cessation in South Africa. *S Afr Med J.* 2010; 100:175–179. [PubMed: 20459943]

What this paper adds

Smoking prevalence remains high among South African adults, and South Africa has a long history of discrimination.

This is the first paper to examine the relationship between racial and nonracial discrimination and smoking status among South African adults.

This study analyzed a nationally representative sample of South African adults and found a significant positive relationship between discrimination and smoking status. Our findings suggest that the relationship between discrimination and smoking may vary by duration of the discrimination (chronic or acute) and the perceived reasons for these experiences (due to race or nonracial attributes).

Table 1Baseline characteristics of respondents in the South Africa Stress and Health study (n=4,240)¹

	All % (n) ²	Current Smoker % (n)	Non-smoker % (n)	p-value
All	100.0% (4240)	20.5% (871)	77.2% (3369)	
Gender				<.0001
Male	46.0% (1676)	38.0% (622)	62.0% (1054)	
Female	54.0% (2564)	9.9% (249)	90.1% (2315)	
Race				<.0001
White	9.6% (299)	37.1% (96)	62.9% (203)	
Black	76.4% (3233)	18.0% (500)	82.0% (2733)	
Coloured	10.4% (543)	42.9% (230)	57.2% (313)	
Indian/Asian/Other	3.7% (165)	27.9% (45)	72.2% (120)	
Age category				<.0001
18–34	51.1% (2153)	22.3% (410)	77.7% (1743)	
35–49	28.0% (1223)	25.9% (290)	74.1% (933)	
50–64	15.7% (625)	22.8% (142)	77.2% (483)	
65+	5.2% (239)	11.6% (29)	88.4% (210)	
Education				
None	6.6% (317)	24.5% (568)	75.5% (244)	.4727
1–7 (Primary)	18.8% (873)	21.6% (183)	78.4% (686)	
8–12 (Secondary)	59.3% (2427)	23.1% (92)	76.9% (1935)	
13+	15.3% (623)	22.6% (28)	77.4% (504)	
HH Income (rands)				<.0001
624	40.2% (1561)	20.8% (291)	79.2% (1270)	
625–1,125	11.5% (464)	18.1% (82)	81.9% (382)	
1,126–2,250	12.5% (662)	19.7% (119)	80.3% (543)	
2,251+	35.9% (1553)	27.7% (379)	72.3% (1174)	
Marital status				.0034
Married	50.2% (2081)	22.4% (425)	77.6% (1656)	
Sep./Wid./Div. ³	6.5% (339)	32.0% (93)	68.0% (246)	
Never Married	43.3% (1820)	21.9% (353)	78.2% (1467)	

¹ Excludes respondents with missing values for smoking status² Percentages are weighted and adjusted for the complex sampling structure.³ Separated, widowed, or divorced

Experiences of racial and nonracial discrimination by race among respondents in the South Africa Stress and Health Study (n=4,240)

Table 2

	White % (n) ¹	Black % (n)	Coloured % (n)	Indian/Asian/ other % (n)	p-value
All	9.6% (299)	76.4% (3233)	10.4% (543)	3.7% (165)	
Chronic Discrimination					
Racial	1.6% (5) ²	15.6% (327)	13.3% (44)	17.6% (17)	.0001
Nonracial	25.2% (40)	31.1% (654)	21.3% (88)	29.6% (33)	.1882
Total	44.8% (96)	56.8% (1423)	44.1% (206)	58.8% (85)	.0871
Acute discrimination ³					
Racial	3.1% (5) ⁴	7.8% (225)	7.2% (40)	11.2% (19)	.0033
Nonracial	17.3% (36)	14.2% (431)	12.1% (60)	20.0% (27)	.2041
Total	18.7% (40)	20.8% (617)	17.9% (89)	25.6% (37)	.3304

¹ Percentages are weighted and adjusted for the complex sampling structure.

² This percentage should be interpreted with caution given the high relative standard error of 50.0%. Values over 30% are considered unreliable.

³ Counts for acute racial and nonracial discrimination add up to greater than total because some respondents reported both (n=99, 2.3%). These individuals were excluded from statistical models.

⁴ This percentage should be interpreted with caution given the high relative standard error of 29.4%.

Table 3

Crude and adjusted relative risks of current smoking associated with discrimination among respondents in the South Africa Stress and Health study (SASH) (n=4,240)

Type	Frequency	% (n) ¹	RR (95%CI)	ARR (95%CI) ²
Model 1: Chronic racial and nonracial discrimination				
Racial	None	85.9% (2482)	REF	REF
	1 or more	14.1% (393)	1.32 (1.08–1.62) *	1.45 (1.14–1.85) *
Nonracial	None	70.6% (2060)	REF	REF
	1 or more	29.4% (815)	1.40 (1.12–1.74) *	1.69 (1.37–2.08) *
Model 2: Total chronic discrimination				
Total	None	45.7% (1667)	REF	REF
	1 or more	54.3% (1810)	1.33 (1.12–1.59) *	1.46 (1.20–1.78) *
Model 3: Acute racial and nonracial discrimination ³				
Racial	None	95.1% (3728)	REF	REF
	1 or more	4.9% (179)	1.22 (0.84–1.77)	1.07 (0.67–1.70)
Nonracial	None	88.1% (3469)	REF	REF
	1 or more	11.9% (438)	1.25 (0.92–1.68)	1.18 (0.85–1.66)
Model 4: Total acute discrimination				
Total	None	79.5% (3290)	REF	REF
	1 or more	20.5% (783)	1.37 (1.14–1.64) *	1.28 (1.01–1.60) *

¹ Percentages are weighted and adjusted for the complex sampling structure.

² Adjusted for gender, race, education, household income, age, and marital status.

³ Respondents who reported both racial and nonracial acute discrimination (n=99, 2.3% of sample) were excluded.

* p<.05